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# FROM WOOL TO CLOTH

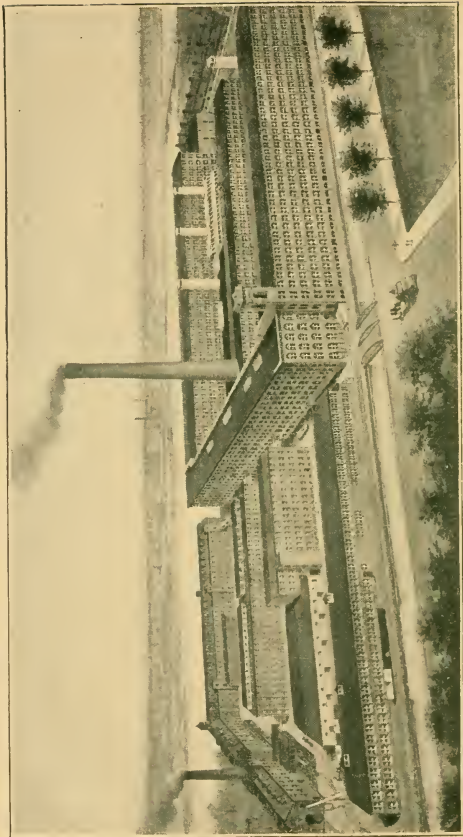


**AMERICAN WOOLEN  
COMPANY**

WM. M. WOOD Vice Pres. & Treas.







*Washington Mills  
Lawrence, Mass.*



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## The Establishment of the Industry.

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EVENTS which led up to the war of the Revolution were commercial as well as political.

England was ever jealous of our rising industries and did everything in her power to check their growth.

This was especially the case in the attempts of the colonists to manufacture the material for their own woolen wearing apparel.

There was always the fadish Tory copying English habits and London styles, proud of his predilection for British customs and of his appearance in the clothing which England sent to this country.

There was also the colonist who stood for the backbone of true Americanism and showed his pride in all things American by patronizing his own institutions.

Thus in the matter of clothes, although the cloth spun and woven at the hearthstone and fullled in the adjunct to the village grist mill was perhaps crude and greatly lacking in the appearance of the English product, yet was preferred by the true colonist, if only for the satisfaction to his pride and patriotism.

Until the latter part of the eighteenth century, the only American Woolen Factory was that composed of the hand card, the spinning wheel by the hearth and the archaic loom.



The year 1788 saw the first attempt to differentiate wool manufacture from a household industry.

In that year by public subscription a small plant was established in Connecticut which started business in 1789.

After attaining the enviable distinction of furnishing the first President of this country with his inaugural suit of clothes, the Connecticut enterprise was abandoned.

In 1794 the first carding machine in America was constructed and put into operation, after which the development of the industry was more rapid.

It was especially favored by the Embargo Act and the War of 1812 which cut off all importations of foreign goods.

The census of 1810, which showed a population in the United States of 7,293,903, stated that there were woven in families

9,528,266 yards of woolen goods and enumerated 372,743 spinning wheels, 122,644 spindles and 225,392 looms, or an average of about one loom to 32 people. It also reported the existence of 24 woolen factories and 1682 fulling mills.

About this time a Connecticut Mill became the first to employ steam for its operative power, installing a 24 horse power engine which drove all the machinery required for carding, spinning, reeling, weaving, fulling, dyeing and finishing.

Prior to 1810, mills for teaseling and napping cloths were erected to some extent in New England and New York.

✓ A great many patents had been granted in the country for shearing cloth some of which were in use at that time.

The comparatively rapid expansion of wool manufacturing in the United States was

stimulated by the exigencies of the country while engaged in warfare. It progressed, nevertheless, under difficulties emanating from the same source, and shortly there came a day when the country under its own resources was unable to supply its soldiers and sailors with the necessary cloth.

Inglorious recourse was then indirectly made to the manufactories of England and in 1813 over half a million dollars was expended for army cloths and blankets of foreign production.

During the war of 1812 broadcloth in this country brought as high as \$18.00 a yard and fine merino wool advanced to \$3.00 and \$4.00 a pound.

In the year of 1810 a party of Rhode Island capitalists purchased the land belonging to the Blodgett Estate at Moosup, Connecticut.

In 1816 a factory was built, which after three years spent in developing and improving the necessary facilities, became a mill for the manufacture of broadcloth.

The story of this mill covers the history of several generations and is typical of the growth of the woolen industry in this country.

The plant today contains not a stick nor a stone of the original buildings, and in its modern construction and equipment bears no resemblance to the original structure.

The Moosup is one of the smallest of the American Woolen Company's plants.

In 1824 a mill was built at Dover, N. H., which carried on a business of carding and cloth dressing, its product being changed in 1832 to the manufacture of flannels.

The mills comprising this plant were built and rebuilt during a period of fifty odd

years, always increasing in size and capacity.

Today, known as the Sawyer Mills, they constitute one of the finest plants in the country for the manufacture of fancy woolens. This was the earliest established plant for its particular line in the American Woolen Company organization.

The process of manufacturing worsted cloths for men's wear was not begun in this country until just prior to 1860, when the Washington Mills is credited with producing the first worsted suitings.

This plant was begun in Lawrence, Massachussets, in 1845, and later became the largest in the world for its class of goods.

A company was chartered in that year under the name of the Bay State Mills, with an authorized capital of \$1,500,000.

Although the construction was begun in 1845, it was not until three years later that

the first wheel was set in motion and the production of several varieties of goods begun.

Most popular of its earlier fabrics was the Bay State Shawl which attained to a national reputation.

Significant of the popularity of this product was an inquiry concerning these fabrics received by the American Woolen Company within the past year, after a lapse of fifty years.

Like the other plants of early inception the "Bay State Mill" was several times built and rebuilt and was finally equipped for the production of cloths for men's wear.

Today they are known as the Washington Mills of the American Woolen Company and constitute the largest men's wear worsted plant in the world.

The floor space of these mills is equal to about thirty acres, and the annual produc-

tion is about 12,000,000 yards of worsted cloth, double width.

Under Mr. William M. Wood's management, the Washington Mills successfully competed with foreign manufacturers and checked the importations of clay worsteds.

In the same year of 1845 a plant was founded in the town of Hudson, Massachusetts, which in 1899 became a part of the American Woolen Company, and has under its management become the largest mill in the world for the production of men's wear woolen goods.

Like most of the large plants in this country, whose history extends over a considerable period, the product of these mills during their development was much diversified.

The original mill—the nucleus of the present plant—was a small wooden building designed for the manufacture of carpets and carpet yarn.

Later this wooden mill was replaced by a brick building and as the business developed other mills were added and the equipment changed to produce cloths for men's wear.

In 1901 was begun the construction of a building which contains under one roof the largest floor space of any mill devoted to the manufacture of woolen goods.

One can stand at an end of this building and look down 690 feet of revolving shafting and flying shuttles.

This building alone contains about nine acres of floor space and is fully equipped for 1,000 looms and their complement of other machinery.

When one realizes how a century ago this country was so subservient in this industry to England and other foreign nations, it certainly is a cause for pride to consider these two



plants which surpass anything in the world in their line of manufacture.

Like many another American industry, woolen manufacture in this country has outstripped foreign competitors.

The machinery of American workmanship is of a cleaner, neater, more efficient type than the usually clumsy machines from the English and Continental shops.

The operatives here are equally as skilled and average on a higher plane of intelligence than abroad.

Climatic conditions and facilities are undoubtedly superior in this country.

Added to these are the immense facilities afforded in the organization of the American Woolen Company, whose mills include the largest, best equipped and most modern plants in the world.

With twenty-eight distinct plants (comprising some 147 separate factories) at its

command, it can centralize and distribute the different processes of manufacture in a way possible to no other woolen manufacturers in the world.

The American Woolen Company has a capital of \$20,000,000 Preferred and \$30,000,000 Common Stock devoted to the manufacture of woollens. It has expended during the past four years upward of \$6,000,000 from its earnings, in bringing the equipment of its mills to the highest state of perfection and efficiency.

With such a combination of mills and capital it has been able to effect many economies and improvements in manufacture, not otherwise possible.

The Company produces a large amount of goods suitable for all classes.

Sixty thousand different fabrics and styles are shown each year.

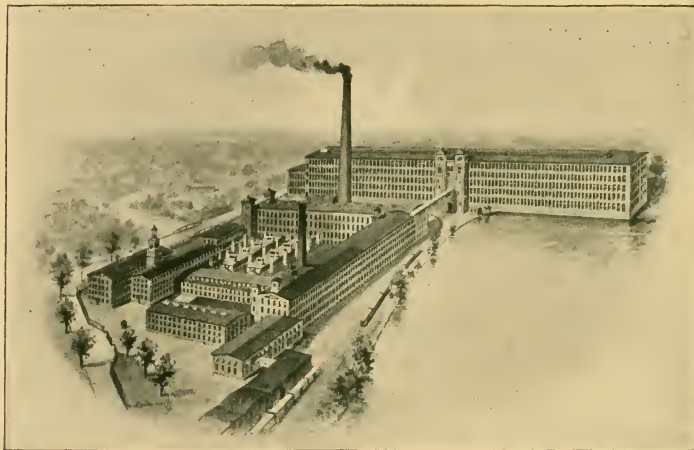
Its finer cloths are unsurpassed in quality and are distinctive and exclusive in style.

The Company buys direct its own raw materials. It spins its own yarn, weaves its own cloth and maintains one of the most extensive selling organizations in the world for the disposal of its fabrics direct.

There are imitations of American Woolen cloths today just as there were several years ago imitations of foreign cloths.

When an American considers the facilities of this Corporation and the modern equipment and extent of its plants, he may be certain that he will obtain the best cloth procurable at the given price if he demands that manufactured by the American Woolen Company.





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*Assabet Mills  
Maynard, Mass.*



## From Wool to Cloth.

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A

AMERICAN Woolen Manufacturers obtain their raw material partly in the United States and partly from abroad.

Australasia, 4000 miles nearer New England than London, is the largest producer of the best wool—the longest staple and the finest fibre—growing about 500,000,000 pounds a year.

South America produces 510,000,000 pounds and North America 304,450,000

pounds, of which the United States gave a product last year of 287,450,000 pounds.

Europe gives the largest production in quantity, but it is composed mostly of the medium and lower grades, such as are used in carpets.

The Australian clip is sold almost altogether through public auctions which are held primarily in the country itself.

The South American wools used by American woolen manufacturers are largely imported direct, although a part of the clip is offered in the London and Liverpool auctions. Several years ago the greater portion of the South American clip was of fine merino wool, but since the introduction of cold storage on the carrying steamers, the growers have changed their flocks to the mutton producing animal which grows a coarse wool.

In the United States, which boasts about 39,000,000 sheep, the wool is frequently of a very fine quality, some of it rivalling even that of Australian growth. Among the finest staples are those brought from Pennsylvania, West Virginia and Ohio, the picklock of the latter State comparing with the choicest Port Phillip or Geelong, while the merino of Vermont is among the finest in the world. In fact the highly bred merinos of Vermont form the basis for much of the best Australian clips, Vermont rams being sold for large sums to the Australian growers.

All of these markets are most available to the American Manufacturers.

When woolen manufacture first emerged from the hearthstones, in our colonial history, the great difficulty which confronted the original workers was the lack of fine fleece



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*Sorting and Grading  
at the Assabet Mills*



wool. Several gentlemen early realized the importance of establishing in this country a flock of fleece producing sheep, and their attempts at importing fine breeds formed the basis of the present magnitude of this industry. One gentleman was given by a friend of his a fine merino ram. Not realizing its importance from the wool standpoint, he enjoyed its excellence as mutton, but when he discovered it would cost \$1,000 to replace the animal, he regretted his haste.

Sheep were imported from the best centres in Europe; some coming from Spain, others from Flanders, until in the early part of the last century the industry in America was well established.

The centre of the wool trade in the United States is, and always has been, Boston. Here in the great storehouses can be seen the wool brought from abroad and from the

Western plains. The buying and selling of the staple forms a distinct trade in itself and constitutes by no means the smallest of New England's many industries.

Wool is brought to this market from the West most frequently in the greasy state. When it arrives at the mills the first process consists of sorting it into different grades, one fleece being separated often into five or more different qualities.

It is then cleansed—or scoured, as the process is called.

This means the passage of the wool by means of automatic rakes through the successive bowls of the wool scouring machine filled with warm soapy water, until it emerges at the other end relieved of the animal grease and dirt with which it may have been filled.

From the last bowl it is carried on an apron, made of slats on chains, or is blown through pipes into the drying machine where most

Sorting  
Classifying the  
grades.

Scouring  
Washing the  
wool.

Drying  
Removing  
moisture after  
scouring.

of the moisture is removed, enough being left in the wool to keep the particles from flying while going through the carding process which comes later.

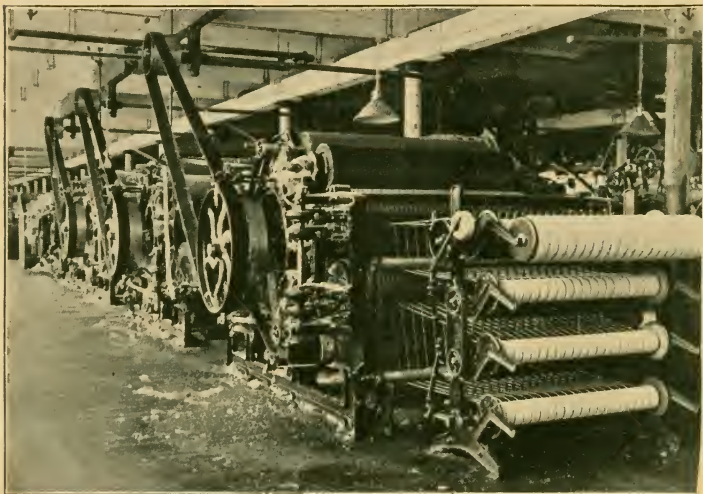
In the manufacture of cloth from wool there are two distinctive processes, that for worsted cloth and that for woolen, the difference between the two being best described by saying that the worsted fabrics consist of yarns in which fibres of wool are laid parallel, and the woolen cloths being composed of yarn in which the fibres are crisscrossed.

Worsted

Woolens

It is obvious, then, that in the worsteds only the long staples can be used, while in the woolen the shorter fibres can be employed. The difference is in the arrangement of the fibres and to arrive at this, different processes are necessary.

In the descriptions of manufacture illustrated herewith, there have been followed



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*Carding  
at the Assabet*

the methods in vogue at the American Woolen Company's mills and particularly at the Washington and the Assabet plants. These two mills are respectively the largest and best equipped plants for men's wear worsted fabrics and men's wear woolen cloths in the world and it is considered that their processes are the most efficient and modern.

Most  
Modern  
Methods

Considering first, the manufacture of worsteds, the next process in order is carding. The wool is fed into the cards automatically and passed between leather clothed cylinders, revolving in opposite directions, from which project the ends of many small wires. These straighten the fibres and deliver the wool in soft strands with the fibres all laid parallel to one another when it is taken off by the doffer comb and rolled into balls of a thick, soft untwisted rope which is called sliver. Eight or ten of these balls are

Worsted  
Carding  
Straightening  
the fibres.



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*Combing at the  
Riverside Mills*

run into one and drawn out into smaller compass through gilling machines. In this process the wool is drawn by rollers between bars filled with pins — called fallers — which, moving slower than the wool, comb and draw out the sliver, further straightening the fibres and completing the preparation for the combing process. The balls of wool are then run through the combing machine which removes the remaining dirt and all the shorter wool.

Combing  
Separating the  
long from the  
short fibres.

After passing through the combs the wool is rolled into balls about a foot in diameter and then appears as Tops. Another drawing out process follows still further reducing the number of fibres in the untwisted thread but maintaining them in their relatively parallel position ready for spinning.

Tops  
Long selected  
fibres

In the first steps in drawing and spinning, the sliver is conveyed into the drawing ma-

chines and during its passage through these is drawn out with a slight twisting motion again reducing the size. The actual spinning consists of a continuation of this process until the fibres are reduced to twisted thread, generally fifteen turns to the inch. Two threads are often twisted together and sometimes as many as four strands are made into one thread.

Spinning  
Making the yarn.

The next process is the preparation of the yarn for weaving in which it is used in two ways, as warp, which runs the length of the cloth, and filling, which runs crossways of the cloth. The warp threads are put on large reels and from these are transferred to a large roll which is called the warp beam and holds all of the warp threads. The filling is put on shuttle bobbins which are placed in the shuttle and are kept filled by the weaver as the process requires.

Warp  
Yarns running  
lengthwise.

Filling  
Yarns running  
crosswise.

Dressing  
Preparing yarn  
for loom.



For the manufacture of woollen goods the shorter fibred wools are used and in certain stages a different process is employed than that with which the worsted materials are treated. If the wool should contain burrs or other vegetable matter it is dipped into a bath of chloride of aluminum or a sulphuric acid solution and afterward baked, which carbonizes the foreign substance but does not affect the animal fibres. There is also employed a machine called the burr picker, whose name implies its use. The wool is then ready for the picker which prepares it for the carding process. If the wool is to be blended with other stock it is laid upon the floor near the picker and mixed with the other grades which are thoroughly blended in their progress through the picker. From the picker the stock is fed on to the cards automatically by a so-called "self

Woolens

Carbonizing  
Removing vegetable matter.

Picking  
Breaking the matted locks and mixing the Stock.

Woolen Carding  
Straightening the fibres.



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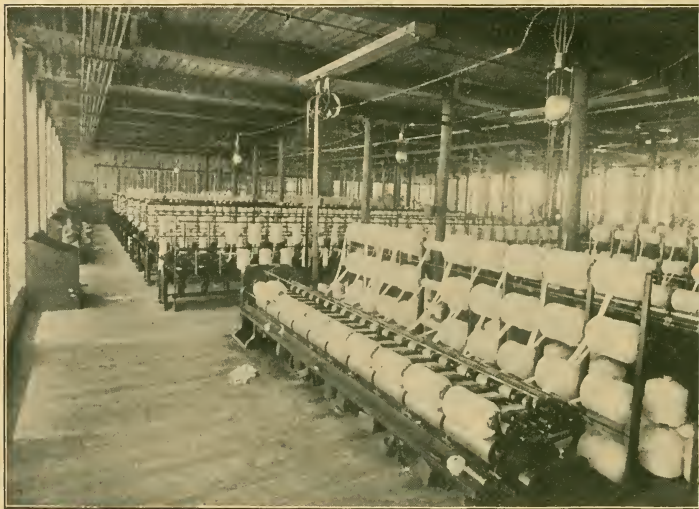
*Mule Spinning  
at the Assabet*

feed" which weighs it and spreads it on the feeding apron from which it passes through a series of cylinders covered with wire clothing, in connection with which there are smaller cylinders performing similar work called workers, fancies, strippers, doffers, etc. This process delivers the wool or stock in the form of numerous soft strands or threads, graded in size according to the size thread to be spun, on to spools with the required number of strands on each spool.

It then passes to the spinning machine, or mule, where it is spun into warp or filling yarn as desired. There are various sizes of these machines and the yarns are spun sometimes on paper cop tubes or in other cases on bobbins.

The filling yarns go direct from the spinning room to the weave room, as they are used in the loom without further process.

Spinning  
Making woolen  
yarn.



*French Drawing  
at the Washington Mills*

The warp yarns are spooled from the bobbin on to dresser spools. A number of these spools are assembled into a rack until the required number of threads for a section is obtained. The process of dressing consists of winding it from these smaller spools on to a large reel which stretches the yarn evenly and from this on to a beam which contains the number of ends required for a warp—usually several thousand. To prepare the warp for the loom there is what is called the drawing-in process, which is done by drawing the ends of the yarns through the respective eye-lets of the harness heddles. These frames, after being placed in the loom, are raised or lowered in the process of weaving by the loom mechanism called the head motion, which allows the filling shuttles to pass above some threads and below others following out the pattern designed.

**Drawing in**  
Following the  
design.

**Weaving**  
Making the cloth.



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*Weave Room  
at the Washington Mills*

The cloth leaves the loom in the form of a cut or piece after it is woven the desired length which varies according to the fabric. It is then carefully examined for any imperfections that may appear, after which the process of burling or mending is taken up, knots being carefully removed and any threads woven in wrongly, or other imperfections, taken out and sewn in by hand. The employees engaged in this work become most expert and are able to correct perfectly by hand any imperfection which may occur in the process of weaving, such as the breaking of threads and similar unavoidable accidents.

Burling and  
Mending  
Correcting im-  
perfections.

The finishing process varies according to the fabric being made. Broadcloths and other face finished goods require much more treatment than worsted cloths or fancy woolens. The former are sometimes scoured or cleansed in the washers before fulling and

Finishing



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*Burling, Mending  
and Examining  
at the Washington Mills*



often go directly to the fulling mill without previous cleansing.

The shorter fibres in the woolen yarn cannot be woven into so close or firm a fabric as is possible with the long parallel fibres in the worsted yarn and in order to make a perfect cloth from the former it is necessary in many cases to felt the fibres together by fulling or shrinking. This process consists of running cloth through a fulling mill which subjects it while in motion to great pressure, it being at the same time moistened with a specially prepared soap. This work felts or mats the fibres together, making a firm and durable fabric. The amount of shrinkage that will occur in the various fabrics when subjected to the fulling process is accurately gauged and full allowance therefor is made before the cloth goes to the fulling mill. In order to obtain a

Fulling  
Matting the  
fibres together.

length say of fifty yards after the cloth is fullled, some fabrics must come from the loom sixty yards in length. Other woolens shrink less.

After fulling, the cloth is thoroughly washed and if any vegetable fibres remain it is put through a carbonizing process. According to the finish desired, the cloth is then napped or giggered. If a face or smooth finish is desired the cloth is first napped or giggered by the use of a wire napping machine or a teasel gig. This process raises the ends of the fibres on the face of the cloth. It is afterwards sheared and pressed. The teasel used in giggering the cloth is a vegetable product in form somewhat the shape of a pine cone. Invention has not yet discovered a mechanical process which can entirely supplant it. If a lustrous finish is desired the

Napping or  
Giggering  
Raising the ends  
of fibres.

Teasel  
A vegetable  
product.

cloth is wound on copper cylinders and steam forced through it at a high pressure.

The cloth now ready for coloring is put into large dye tubs which hold six or more pieces according to the weight of the fabric and contain the desired shades of colorings.

This process is descriptive of the so-called piece-dye fabric meaning that it is dyed after being woven. A cloth composed of various colored yarns, or as it is termed a mixture, is treated differently, the stock being dyed before the picking process or immediately after scouring. In a worsted mixture the dyeing is done either while the wool is in the slubbing—that is when it has been subjected to the first combing process—or the yarn is dyed in the skein.

Piece dyeing  
Dyeing a cloth.

Stock dyeing  
Dyeing wool.

After being taken from the dye-vats the cloth is passed to the dryers and subjected to the several processes of dry finishing which



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*Finishing  
at the Washington Mills*

the various kinds of finish demand, the cloth being steamed, brushed and pressed. It is then submitted to another careful and rigid Examining examination. If any imperfections or defects appear which are not easily remediable the cloth is rejected and graded as so-called seconds. Then comes the measuring and packing when the cloth finally is ready for the market.





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*National and  
Providence  
Worsted Mills  
Providence, R. I.*



**T**HE American Woolen Company was formed in the early part of 1899. The corporation has a capital of \$50,000,000 and operates 28 distinct plants comprising 147 buildings with a floor space of 125 acres.

At the head of this organization is Mr. William M. Wood, who has been the Company's treasurer and chief executive since its inception.

The policy of the Company is the manufacture of a large amount of goods at a small margin of profit, and with its 7,000 looms it has facilities for producing the best cloth at the least cost.

The Company produces a great many yards of cloth, but its product is much diversified—as many as 60,000 different fabrics and styles being shown each year.

Standing as it does at the very head of the woolen manufacturing industry in the world, it produces goods within the reach of all classes as well as cloth for the finest wear which is unsurpassed at home or abroad.

### American Woolen Company Properties

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WASHINGTON MILLS . . .	Lawrence, Mass.
SARANAC MILLS . . .	Blackstone, Mass.
NATIONAL & PROVIDENCE	
WORSTED MILLS . . .	Providence, R. I.
FULTON MILLS . . . .	Fulton, N. Y.
FITCHBURG MILLS . . .	Fitchburg, Mass.
BEOLI MILLS . . . .	Fitchburg, Mass.
VALLEY MILLS . . . .	Providence, R. I.
RIVERSIDE MILLS . . .	Providence, R. I.
ASSABET MILLS . . . .	Maynard, Mass.
SAWYER MILLS . . . .	Dover, N. H.



BAY STATE MILLS . . .	Lowell, Mass.
BEAVER BROOK MILLS . . .	Lowell, Mass.
VASSALBORO MILLS . . .	North Vassalboro, Me.
PURITAN MILLS . . .	Plymouth, Mass.
ANDERSON MILLS . . .	Skowhegan, Me.
KENNEBEC MILLS . . .	Fairfield, Me.
MANTON MILLS . . .	Manton, R. I.
ANCHOR MILLS . . .	Harrisville & Pascoag, R. I.
BURLINGTON MILLS . . .	Winooski, Vt.
CHASE MILLS . . .	Webster, Mass.
BROWN MILLS . . .	Dover, Me.
RAY MILLS . . .	Franklin, Mass.
WEYBOSSET MILLS . . .	Providence, R. I.
BALTIC MILLS . . .	Enfield, N. H.
MOOSUP MILLS . . .	Moosup, Conn.
LEBANON MILLS . . .	Lebanon, N. H.
PROSPECT MILLS . . .	Lawrence, Mass.
GLOBE MILLS . . .	Lawrence, Mass.







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